

Decay and yrast level systematics of $^{110-115}\text{Rh}$ from spontaneous fission

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In the framework of our ongoing analysis of prompt γ -rays emitted in spontaneous fission of ^{252}Cf , we investigated the decay and nuclear structure of six rhodium isotopes, $^{110-115}\text{Rh}$. Data from two ^{252}Cf Gammasphere experiments were included in the analysis. 1) A thick 25 μci source experiment with two Ge LEPS detectors inside a 72 detector configuration, and 2) a thin source experiment with simultaneous detection of the two fission fragments by means of a PPAC array (CHICO) placed inside Gammasphere [1]. The thick source data were used for the initial identification and assignment of the most intense γ -rays in each isotope. The relatively low background and freedom from fission partner interference in fragment-mass gated thin source spectra were particularly useful for unambiguous identification and assignment of weaker γ -rays. The energies of γ -rays assigned to each isotope are listed below.

^{110}Rh : 295.0-, 304.5-, 331.0-, 341.4-, 369.4-, 673.5-, 711.4- and 734.2 keV.

^{111}Rh : 162.1-, 211.8-, 224.2-, 224.4-, 224.8-, 242.8-, 251.5-, 279.7-, 295.5-, 313.8-, 316.3-, 354.6-, 361.1-, 377.7-, 397.3-, 402.3-, 409.5-, 411.0-, 443.1-, 491.5-, 504.5-, (513.7-), 529.3-, 549.3-, 577.0-, 629.2-, 658.4-, 661.0-, 667.5-, 667.9-, 725.8-, 737.9-, 765.6-, 773.6-, 773.7-, 792.3- and (891.4-) keV.

^{112}Rh : 61.0-, 159.2-, 183.2-, 242.0-, 268.8-, 328.2-, 343.5-, 362.5-, 399.5-, 427.1-, 485.5-, 510.8-, 570.2-, 690.7-, 706.0-, 761.0-, 822.0-, 830.0-, 896.0- and 927.0 keV.

^{113}Rh : 114.0-, 211.8-, 232.4-, 241.0-, 244.5-, 253.1-, 262.2-, 313.5-, 345.1-, 357.7-, 359.2-, 365.5-, 368.5-

384.2-, 389.2-, 391.2-, 432.1-, 444.0-, 473.2-, 599.5-, 611.5-, 621.6-, 632.2-, 635.7-, (653.8-), 666.9-, 685.2-, 694.3-, 700.0-, 713.6-, 717.7-, 724.7- and 737.3 keV.

^{114}Rh : 195.5-, 211.0-, 263.5-, 297.3-, 316.4-, 406.6-, 614.2- and 735.9 keV.

^{115}Rh : 210.8-, 277.8-, 324.2-, 432.0-, 451.8-, 495.5-, 751.0-, (821.0-), 886.6- and (1018) keV.

Levels and γ -transitions in $^{110,111,113}\text{Rh}$ were also observed in β -decay of the respective Ru isotopes [2]. Except for the 211.8 keV $9/2^+$ first excited level in both ^{111}Rh and ^{113}Rh , there is no overlap between levels populated in β -decay and those identified in our work. Transitions for the other three nuclei are reported here for the first time. Level schemes incorporating all the γ -rays listed above were constructed for $^{111-113}\text{Rh}$. In the odd mass ^{111}Rh and ^{113}Rh , the most prominent feature is a positive-parity band with appreciable signature splitting, observed up to spins of $31/2^+$ and $29/2^+$ in the two isotopes, respectively. Interpretation in terms of underlying nuclear structure effects is in progress.

Footnotes and References

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1. M.W. Simon et al., Proceedings of the International Conference on Fission and Properties of Neutron-Rich Nuclei, held Nov. 10-15, 1997 on Sanibel Island, FL (in print).
2. R.B. Firestone et al., Table of Isotopes, 8th ed. (John Wiley and Sons Inc., New York, 1996)